NOVEMBER 1934 ● VOL. III · No. 7

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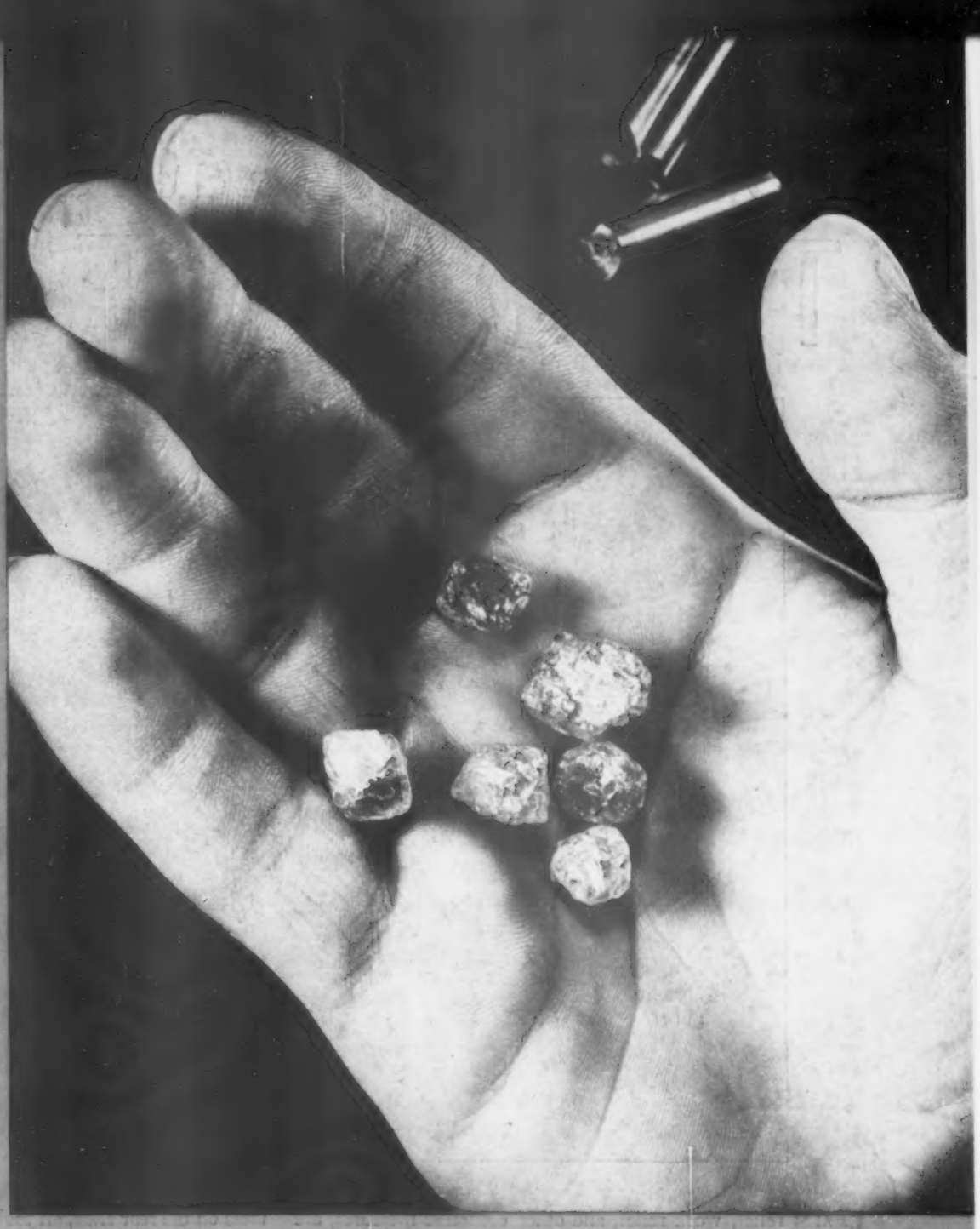


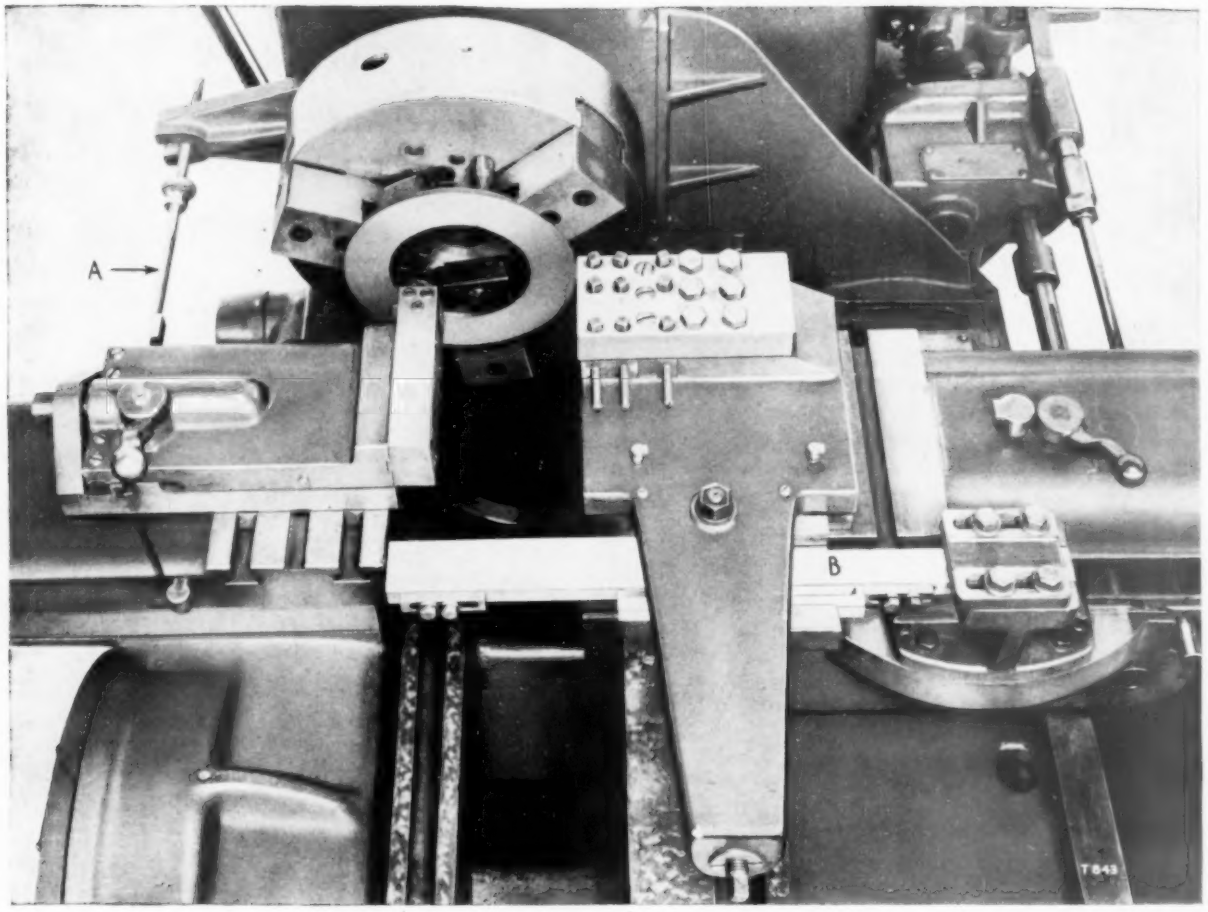
"Diamonds in the Rough"—their application by the Tool Engineer. *See page 9.*

The A.S.T.E. Journal

Official Publication of the

AMERICAN SOCIETY OF TOOL ENGINEERS

Sundstrand Lathes Have TOOL RELIEF



FARM relief, work relief, and other economic measures, are subjects of much current discussion. Important as these matters are to everyone, another kind of relief—namely tool relief—is especially important to the metal-working industry. Formerly desirable on some operations, tool relief becomes essential when tungsten carbide or other tipped tools are used. It is necessary to prevent tips from being broken or dislodged, to prevent finely finished surfaces from being marred by returning tools. Tool relief is perhaps most desirable in lathe work. Automatic tool relief, patent pending, can be applied to almost any Sundstrand lathe, anytime, anywhere.

Above is a close-up of a Sundstrand 15" Automatic Lathe having tool relief, indicated by "A" and "B" respectively, for the two boring tools on the front slide and three facing tools on the rear slide, all tools being tungsten carbide tipped. This lathe had seen much service in our customer's plant. It was sent to Sundstrand for overhauling and tooling, including automatic tool relief, for machining cast iron rings. Similar procedure can be adopted for any Sundstrand lathe now in service which does not have tool relief. Sundstrand lathes of latest design have tool slides built so that automatic tool relief can be installed at the customer's plant, without machining, when this equipment is not included in the original purchase. Let us show you what Sundstrand Lathes with (or without) automatic tool relief have done for others, and let us figure on what they can do for you.

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The A.S.T.E. Journal

Published Monthly by The A.S.T.E. Journal Publishers for members of the

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Vol. III November, 1934 No. 7

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Address all correspondence pertaining to editorial matter in *The A.S.T.E. Journal* to Editor's office. Refer all other matters and advertising in *The A.S.T.E. Journal* to the Business Manager.

INFORMATION PERTAINING TO MEMBERSHIP IN THE AMERICAN SOCIETY OF TOOL ENGINEERS may be had by addressing the Secretary's office. All matters relative to the Society should also be addressed to the Secretary's office—8316 Woodward Avenue, Detroit, Michigan, Telephone Madison 2057.

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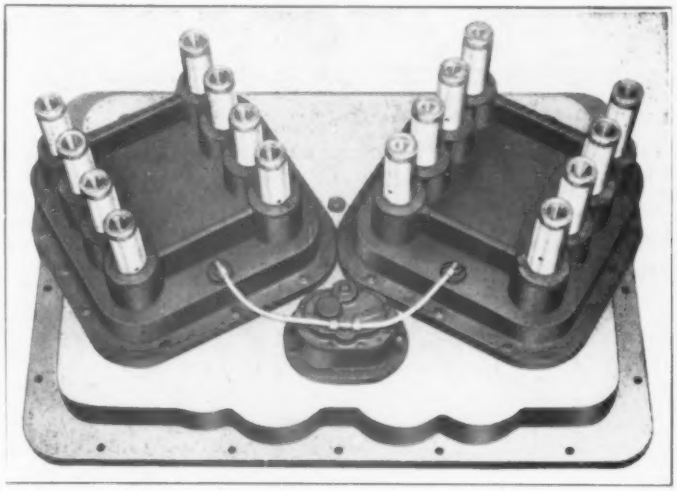

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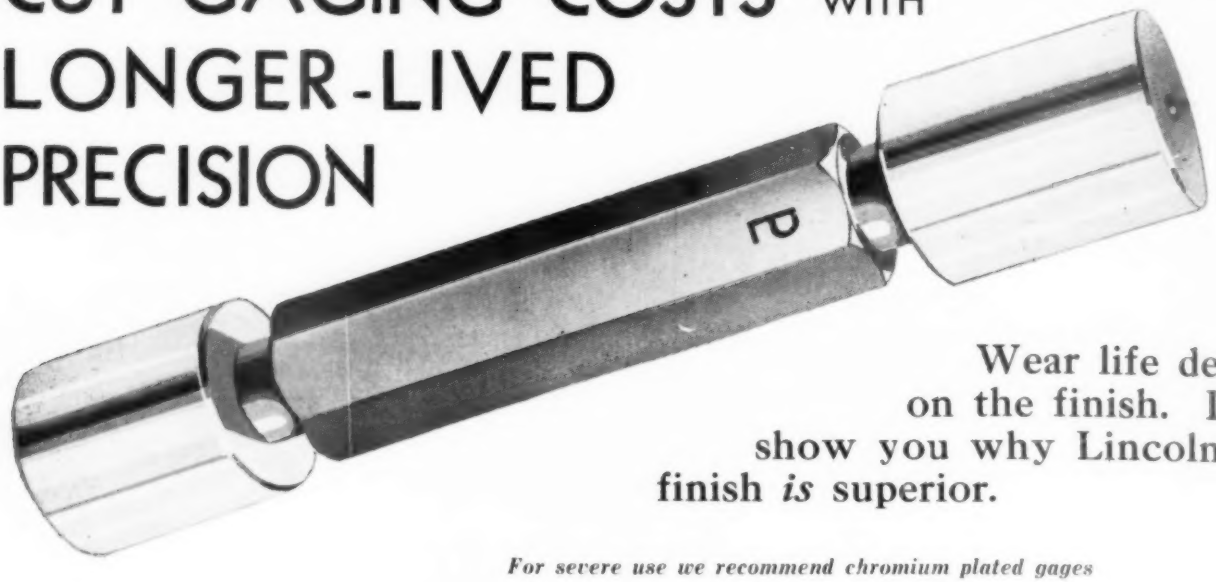

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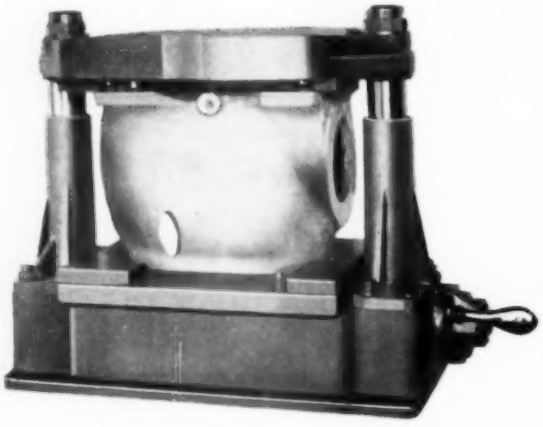

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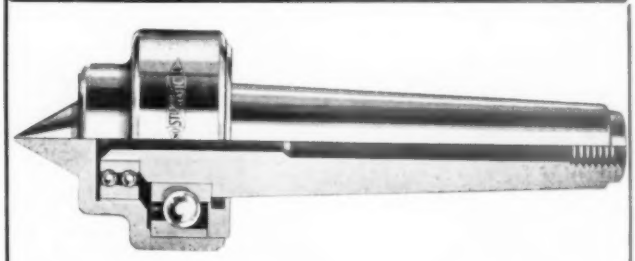

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NOVEMBER MEETING

(Detroit)

HOTEL FORT SHELBY BALLROOM

November 8th, (Thursday)

Dinner: 6:00 p. m.

Meeting: 8:00 p. m.

"The Machine Tool Industry and Its Relationship to the Automotive Industry."

by

RALPH E. FLANDERS*

PRESIDENT AMERICAN SOCIETY OF MECHANICAL ENGINEERS

*The Society is particularly fortunate in having Mr. Ralph E. Flanders address this meeting. He is well known in the tool engineering world as well as in the high seats of government and economics. To mention just a few of the honors which have been his, he is a member of the Industrial Advisory Board of the NRA and of the Business Advisory and Planning Council, also is President of the American Society of Mechanical Engineers. He is known as a national authority on machine design and construction, representing the American Society of Mechanical Engineers on the Sectional Committee on Standardization and Unification of screw threads since 1921 and serving as chairman since 1930.

Mr. Flanders was President of the National Machine Tool Builders Association in 1924. He is a director of the Social Science Research Council, and is a lecturer at the Tuck School of Business Administration at Dartmouth College.

Every member in the Dettroit area should attend this important and instructive meeting, and members from other sections should make every effort to come to Detroit for this great occasion.

Special entertainment talent in connection with this meeting is announced by the entertainment committee.

To participate in the prize drawing make your reservations *in advance.* Tickets purchased at the door will *not* entitle you to participation in the prize drawing.

"ANY OLD SEED IS NOT GOOD ENOUGH FOR THE WISE FARMER"

THE SELECTION OF MEN

by John Younger

MEN are the most unstandardized units in the industrial world, so it is necessary to pick out each individual so that he may be most satisfactory in his appointed work.

It is comparatively easy to pick out or select the workman. It is difficult to select the future executive. A man who is selected for and placed in a position for which he is admirably suited will respond to his work most generously. He must be satisfied with his job. He will make greater returns or profits on the job and his influence will stimulate the morale of the shop. He will become a good citizen, feeling that he is fulfilling his purpose in life.

The man improperly selected and placed will be just the contrary. He will be dissatisfied—will be a source of trouble to his neighbors—he will spoil work—his output will be below standard—and he will invariably never hesitate to quit the job at the first opportunity.

It costs money to hire and fire men indiscriminately. After you have hired a man, you spend money in his initial training. You may have to teach him where to hang his hat and coat, how to make out requisition slips, where material can be found, how to control his machine and so forth. During his probation period he will often spoil some work. Authorities have estimated the cost of this initial period as anywhere between $50 and $250, depending on the class of help engaged. You lose this money if after the probation period you find the man unsatisfactory and you have to fire him. Hence the need for careful selection.

Any old seed is not good enough for the wise farmer. Only the best seed properly selected is productive of the greatest crops. Luther Burbank did marvelous feats almost entirely by his skilful selection of seeds. Surely we can expect just as marvelous returns from the skilful selection of men.

There are two types of men to be considered, the trained and the untrained. The trained man often has the ability to select for himself and determine what his course of action and future career will be. The untrained man rarely knows what he wants to do with himself and his work has often to be selected for him, based on his latent undefined qualifications. Some men are unfortunate. They never do find out what their special aptitude is, but perhaps the unfortunate are those who know what they want to do but are prohibited from doing it by force of circumstances.

Some men like to work in wood. They like its odor, its cleanliness, its easy working characteristics, and so they become carpenters or cabinet makers. Others like the feel of metals and so become metal workers, either at machine or bench. Some men are intrigued by the wonders of electricity. They like to delve into its abstract mysteries and so become electricians or possibly electrical engineers. Other men like the feel of textiles. They like its colors, its texture, its softness, and so they become workers in the textile mills or clothing factories.

Instances such as these might be repeated infinitely. It is sufficient to say that a first brief conference with a man will often indicate what his inclinations are. Inclinations are however insufficient without ability and a test is necessary to determine the facts.

In the earlier days of industry, some twenty or thirty years ago, workmen were usually hired at the gate by the foreman. As the foreman walked to his work at 6:00 A.M. men would approach him and ask for jobs. The writer well remembers one such occurrence with Jimmie Good, an old-fashioned foreman. "Mr. Good," the man said, "can I have a job?" "What can you do my man?", said Jimmie. "I can do anything, Mr. Good. I can turn crank pins or axle shafts for locomotives or any turning job you have." "Did you ever make a mistake?" said Jimmie. "No sir, I never made a mistake," was the reply. "Well then," concluded Jimmie, "you are not the man for us. The man that never made a mistake never made anything." The interview was at an end and perhaps a good man lost through over zealousness on his part and undue caution on the part of the foreman.

Today our prospective employee is interviewed by the employment manager. If he states he wants employment as a machinist, he is given a simple test. He is handed a micrometer and a shaft of steel. "What is the diameter?", he is asked. He is watched in the handling of the "mike." If he treats it as he would a boilermaker's clamp and knows nothing of its delicacy, you can at once conclude that though he may be a machinist of the rough type he is certainly not used to delicate work. If on the contrary he handles the tool with precision and gives you an accurate reading of the diameter, you are safe in going further with him and perhaps taking a chance with him. Sometimes the man is taken out in the shop and asked to demonstrate on some idle machine within his range. If he shows he understands the controls and can manage the machine, you are reasonably safe in hiring him.

These tests, of course, only discover a man's skill; there are few tests which show the man's effort or continuity of performance. These facts can sometimes be discovered by looking up the references the man gives to previous em-

(Continued on page 12)

CINCINNATI EXCURSION A BIG SUCCESS

by FORD R. LAMB

THE special excursion trip to Cincinnati, Ohio, which was sponsored by The American Society of Tool Engineers was very successful and enjoyed by all who made the trip. About 300 from the Detroit, Pontiac, and Flint districts left Detroit on a special train furnished by the B. & O. Railroad, Friday October 19, to visit a special exhibition of Machine Tools at the plant of The Cincinnati Milling Machine Co. and Cincinnati Grinders Inc.

This special exhibit was arranged by the Cincinnati Milling Machine Co. as a celebration of their 50th anniversary and the excursionists were guests of the Cincinnati Milling Machine Co. while in Cincinnati.

The special train was made up of day coaches with a baggage car at each end of the trains so arranged to dispense refreshments. This arrangement was well chosen for very little sleeping was done on the down trip. It afforded a wonderful opportunity for Tool Engineers to get together and get better acquainted with each other. In fact when we heard some of the good singing we wondered why the singers were Tool Engineers instead of radio entertainers. Apparently Tool Engineers are versatile as a group.

The special train arrived in Cincinnati at 7:00 a. m. Saturday and was backed onto the siding of the United States Playing Card Co. The group was ushered into the dining room of this plant and served a nice hearty breakfast of which they were much in need. After breakfast they re-entered the train and were transported close to the plant of the Cincinnati Milling Machine Co. which they entered.

Mr. W. W. Tangeman of the Cincinnati Milling Machine Co. addressed the group, welcomed them to the plant and explained the nature of the Machine Tool exhibition and the method of conducting the visitors through the plant. Guides were furnished for each group of eight or ten visitors and conducted his group through the special permanent exhibit, the machine shop, foundry, assembly, and test divisions explaining detail as they went along. In the permanent exhibit all late model machines were in operation and older model machines were placed so as to show the history of the development of milling and grinding. It is impossible to describe all that we saw although it was all very interesting. The entire plant was in operation so the visitors could see every operation in the manufacture of the products of the company.

In addition to the Cincinnati line of milling, grinding, broaching and lapping machines, the Heald line of boring and internal grinding machines were shown in a special section. This group included the Heald centerless internal grinder.

After the trip through the plant was completed the visitors were ushered into the plant dining room and were served with a fried chicken dinner.

Mr. F. V. Geier of the Cincinnati Milling Machine Co. then thanked the visitors for their interest and for the privilege of entertaining them and told them of the program arranged for the balance of the day.

"Bert" Carpenter, President of the American Society of Tool Engineers thanked the hosts for the wonderful treatment we had received and the rising vote of thanks was heart felt for it is hard to conceive how our hosts could have extended us finer hospitality.

The afternoon was enlivened somewhat by one individual of the group whom no one seemed to know. He took himself quite seriously and thought he should lead the activities, but no one took him seriously and he was forced to subside after some embarrassment.

The trip home was very quiet for most of the fellows needed sleep badly by this time. However, some hardy fellows kept the action going all the way to Detroit so the trip back was not too dull. The special train arrived in Detroit at 12:30 Saturday night ending a wonderful trip.

Musings of an Old Timer

By Anders Jansson

Happened to pick up a paper from the old home town a few days ago. In it, an item stirred fond recollections, and started me to wondering whether they breed 'em that way any more. Reduced to essentials, the item follows: "Mr. Otto Blank, former works manager of the Nemo Mfg. Co., is carving a new name for himself—in wood. For years a paralytic, Mr. B. carried on, designing machinery and tools in bed, then, the depression cutting in on his vocation, he turned to wood carving as a hobby. Today, his carvings are in great demand because of their grace and life-like appearance. Several years ago, Mr. B. learned to walk again, and now, on sunny days, he is seen in the park, studying the feathered creatures he so skillfully reproduces. Mr. B. is 80 years old."

I served my apprenticeship under him. He was a martinet, but one to whom his "boys" were devoted. We worked 59 hours a week, at 6, 8 and 10 cents per hour the first, second and third years of our training. Saturday, before closing, all machinery was cleaned. Then old "Otto" would come around, and tentatively wipe each machine with a clean handkerchief. Woe to the boy whose machine sullied its pristine whiteness! But, he turned out mechanics.

I recall when he was stricken, at 55 or so. "yes, Andy, I will walk again." he said, confidently. "See, I have an idea . . . . . " and he sketched, enthusiastically. And years later, visiting him, I saw him drag himself painfully along an improvised set of parallel bars. "See, I can move my legs a little. Soon I will be walking again. You'll see."

And more years rolled by. Married, and settled in a distant city, the wife and I decided to visit the

(Continued on page 10.)

• MEMBERS DESIGN AND BUILD • NEW TYPE BROACHING MACHINE

• • • •

AT least five A.S.T.E. members have had a hand in the development and construction of a special horizontal broaching machine, the main feature of which is that the broach itself is handled automatically, leaving the operator free to load and unload the work. W. A. Hart engineer in charge of this development at the Colonial Broach Company in Detroit with Ben Welte, Dave Nelson, Dick Thompson, Carl Halborg have been responsible for the engineering developments of the new machine while Mr. Dave Forsman of the Sterling-French Machinery Company will be in charge of sales and also has been responsible for a number of new features. This machine will be built in the plant of the Michigan Tool Company in Detroit.

The machine is of extra heavy welded steel fabrication, built to withstand the high speed of the broach without interference of chatter. A unique feature is the angular base and slide design, which is wholly covered and protected thus providing a natural condition to shed the shavings away from the broach and fixture, also the machine is fully equipped with hardened steel ways to assure long life and alignment.

In the base there are four compartments; one for the motors; 2nd for hydraulic equipment; 3rd for an unusually large capacity oil tank to insure a cool running circuit; and 4th a sizable coolant and chip compartment.

The machine is equipped with a forced feed lubrication system being so installed that on each cycle of the broaching machine it receives a measured amount of oil to all reciprocating parts.

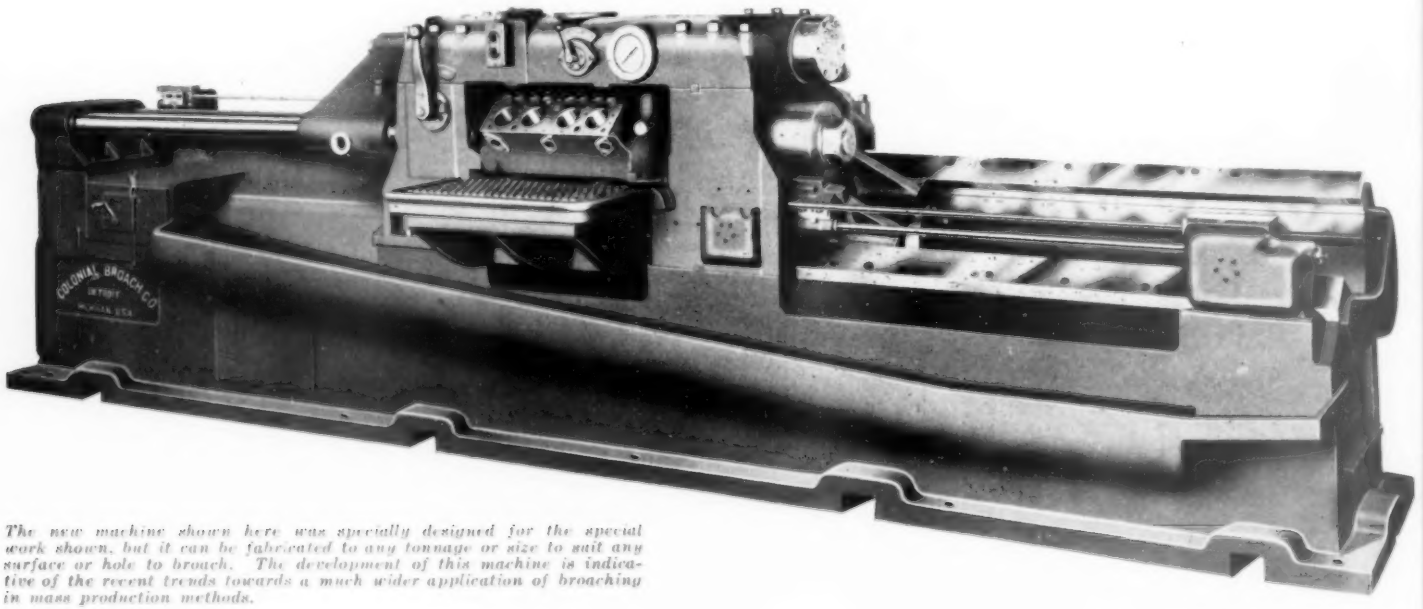
Coolant system is hooked up to deliver only when broach is actually cutting; remainder of the cycle it by-passes to tank.

Pressure gage is provided to record broaching pressure; also there is an emergency stop lever so that machine can be stopped instantly should the occasion require.

Cutting speed of the broach ram is 540" per min. together with a rapid turn of 720" per min. The illustration shows this machine tooled up to *align-broach* three cam shaft holes in a cylinder block.

Fixture is level with conveyor height allowing the operator to slide the cylinder block over a diamond shaped serrated plate to wipe bottom before entering into fixture. When inserting block into fixture, it is brought up against two temporary locating stops to center same to facilitate the locating plungers entering for final centering and these locating plungers are brought into place by the same lever which controls the cycle of machine. One lever controls the locating plungers, throws in the hydraulic circuit which controls the complete broaching cycle. This single lever feature insures perfect block alignment with broach, a safety precaution which prevents any starting of the machine until the part is correctly located in fixture.

On the completion of the broaching stroke, an auxiliary oil cylinder pushes the block from the broaching position to front loading station, allowing the operator to slide the block on to the conveyor line and insuring absolute safety for operator and machine. The broach then returns to starting position completing the cycle.



The new machine shown here was specially designed for the special work shown, but it can be fabricated to any tonnage or size to suit any surface or hole to broach. The development of this machine is indicative of the recent trends towards a much wider application of broaching in mass production methods.

"DIAMONDS IN THE ROUGH"

Their Application by the TOOL ENGINEER

★ by F. H. WILLEY
Industrial Diamond Co., Detroit

●*"The 'Bortz', or African diamonds are the most widely used in industry today." Above photo is of the entrance to the famous Kimberly Diamond Mine, largest in the world.*

In writing this article, it is the aim of the author to emphasize the increasing demand and importance of the diamond in the steady progress of industry.

PRIMARILY, diamonds are mined for the production of gems and the general opinion prevails that industrial diamonds are imperfect. This, however, is misleading, as some diamonds are too hard and knotty; some contain carbon spots or flaws, making them unsuitable for cutting into gems or shaped tools, thereby putting them in what we call the "Abrasive" class of diamonds, which are again divided into two classes, the "Carbon" and "Bortz."

The "Carbon" is the harder of the two, resembling a piece of lava or coal. These diamonds have no cleavage lines and are found exclusively in the State of Bahia, in the interior of Brazil. Their chief use is the manufacture of core drills and rock bits.

The "Bortz," or African diamonds, were first discovered in 1867 and are the most widely used in manufacturing today. It is estimated that approximately 90% of the factories use this type of stone, which we will also divide into separate classes:

First: "Ballas" diamonds, (meaning "round") range in color from black to gray and are used principally in the abrasive field for the dressing of grinding wheels. These diamonds have no superiority for this type of work.

Second: "Bortz" diamonds come in various shapes and range in colors from pure white through various shades of gray, blue, green, yellow, brown, black, etc. This type of diamond is used extensively for the dressing of grinding wheels.

However, after careful study, certain stones—having definite cleavage lines and shape—are selected to be cut into shaped tools. There is a close relationship between these diamonds and our everyday life, which must be appreciated when one considers that there is hardly an article of daily use, whether for practical purposes or for pleasure, in which diamonds are not used, either directly or indirectly. For instance, diamonds play a very important part in the making of automobiles, radios, moving pictures, telephones and electrical apparatus, only to mention a few. At the present time, a diamond used on the "Profilograph," a new measuring device, measures to limits of as little as .000001".

Diamonds which are used for testing the hardness of metals come principally from Brazil and are selected for their shape, hardness, density, freedom from flaws and imperfections. These are then mounted securely and cut to definite angles and radii and each tool must be the exact duplicate of the one before.

Diamond boring tools are a very important factor in the manufacture of fine cars and parts, having a wide range of use in the making of the lowest to the highest priced cars on the market today. They aid the manufacturer to produce exact mirror finishes on turning and boring parts made of non-ferrous alloys.

In designing diamond boring tools for maximum economy and efficiency, care must be taken as to

(Continued on page 13.)

MILLING LOADS

by O. B. JONES, **Editor The A.S.T.E. Journal**

(As Given Before October A.S.T.E. Meeting)

MANY variable factors are involved in determining the power required to mill. Experimenters all agree, however, that—as in the case of the lathe—the horsepower is directly proportional to the volume of metal removed. It is rather well established that a saw-cut, that is, a narrow deep cut, with a rapid feed requires less power than a shallow wide cut such as is taken in slab milling, especially if the feed is slower. The power required to drive irregularly shaped cutters such as are used in contour or profile milling is especially difficult to determine with informataion available today.

For all practical purposes, where a plain type of cutter is used, the following values for the horsepower required to remove one cubic inch of material in a minute may be used:

Aluminum	2/7	Horsepower per cu. in. per min.
Brass and Bronze	2/5	Horsepower per cu. in. per min.
Cast Iron	1	Horsepower per cu. in. per min.
Malleable Iron	1 1/8	Horsepower per cu. in. per min.
Mild Steel	1 3/5	Horsepower per cu. in. per min.
High Grade Steel	2	Horsepower per cu. in. per min.

You will note that more power is required to remove a cubic inch of any metal by milling than is required to remove the same volume of the same material on the lathe. One of the reasons for this is the fact that chips are imprisoned within the flutes of the milling cutter and that they are necessarily coiled into smaller springs than they would be on a lathe. Obviously a coarse tooth cutter should require less horsepower than a fine tooth cutter.

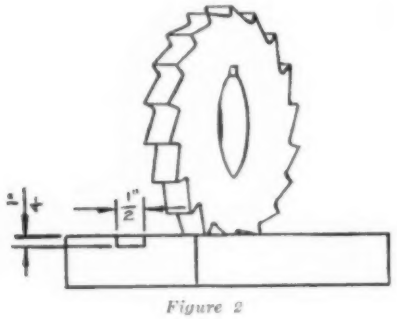


Figure 2

To determine the horsepower required to make the cut shown in Fig. 2 assuming the diameter of the cutter to be 4 inches, feed of table 3 inches, the width of the cut as ½ inch, the depth of the cut as ¼ inch, and the material as mild steel, we first determine the number of cubic inches of material removed in one minute. This is obtained by multiplying the cross-sectional area of the cut by the feed of the table in inches per minute, that is, ½ times ¼ times 3, which gives us 3/8 of a cubic inch. The horsepower required to remove a cubic inch of mild steel according to the table is 1 3/5. Three-eighths of a cubic inch will require 3/8 of the power required to remove one cubic inch, or 1 3/5 times 3/8 equals 3/5. Let us now determine the total tangential thrust (P) of all the teeth on the work. In the case of the lathe the pressure on the bit times the length in feet of the chip produced in a minute indicated the foot-pounds of work performed in a minute. In the case of the milling cutter its peripheral speed in feet per minute times the total pressure P on its cutting teeth indicates its foot-pounds of work accomplished in a minute. Since horsepower is equal to the number of foot-pounds of work performed in a minute divided by 33,000, for the cutter referred to in Fig. 2 3/5=60P/33,000 and P=330 pounds braking action on the cutter.

This 330 pounds pressure exerted by the teeth of the cutter is of value in determining the proportions of the locaters to secure the work piece rigidly; in determining the diameter of the arbor required to carry the torque load; and in determining the proportions of all parts of the machine.

MUSINGS OF AN OLD TIMER

(Continued from page 7.)

folks. Went to church. And there, just as the parson cleared his throat as a prelude to his sermon, came a determined if somewhat erratic tap, tap, shuffle, as a grizzled valiant wended his way to a front seat. But for me, no need to crane my neck with the rest. I *knew*! It was old Otto. He had justified his faith in himself.

And, to give the little story a name, let us call it the Portrait of a Man.

WEDELL JOINS INGERSOLL

Ralph R. Weddell, Consulting Engineer, who recently returned from England after establishing the manufacture of serrated cutters there, is now connected with the Ingersoll Milling Machine Company, Rockford, Illinois.

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AH-31

THE SELECTION OF MEN

(Continued from page 6.)

ployers. Incidentally, references should always be given truthfully. If a man is a loafer or indifferent as regards effort, he should be so characterized. If, on the other hand, he shows ability and good continuous effort, he is entitled to a good reference. References from previous employers are the best that a man can show. A reference from a banker is good as an estimate of character. It is to be regretted that references from clergymen are usually of little value.

We have given a test for a machinist which indicates skill. A simple test which may be used for inspectors indicates quickness of perception. Two decks of cards of different backs are taken and thoroughly shuffled. The prospective inspector is asked to resort them and have his time taken for the process. Comparing his time with that of the average, it can be seen whether he is slow or fast in observation.

Once we were called on to select a gang of truck drivers who had to be men of resourcefulness, as they would be away from the headquarters base of operation. First they were required to drive a properly appointed motor truck. This most of them did readily, being good "steerers." On completion of this test, they were taken aside and interviewed. Meanwhile the truck was being put out of commission by the simple mehtod of changing over the ignition wires. Then the prospects were asked to drive the trucks again. Some were dumbfounded and had absolutely no resourcefulness. They were immediately eliminated. Others lifted up the hood and tried to look intelligent but did nothing. They were also eliminated. The final group that was accepted proceeded in a methodical way to find out what the trouble was and how it could be solved.

Enough tests have been described so that the employer can make out his own tests for his specific employees. These tests may be very elaborate, as where the Yellow Cab Company of Chicago used the motion picture film as a guide to the possibilities of the applicants for taxi-cab positions. Others may be exceedingly simple. Local conditions and the immediate necessity for getting good men are the governing factors.

Some firms have established job specifications to which the applicant must measure. The International Harvester Company has led the way in this respect and has several hundred different jobs classified with their requirements. It seems almost possible from the scope of their work to predict a set of national standards of job specifications which will cover the multitude of special jobs the nation has for employees. The qualifications for spot welding, for example, would be the same all over the country. This opens up a large field for speculation.

Job specifications should include such things as—

Standard of health desirable.
Age necessary.
Ability to reach standard quality of work.
Ability to reach standard speed of work.
Ability to maintain constant speed of work.
Flexibility in taking on new work.
Intelligence in an emergency.
Resourcefulness.

A man selected well on these qualifications is a distinct asset to the company; improperly selected he is a liability.

SELECTION OF EXECUTIVES

The selection of executives is, as we have said, a much more difficult matter. Today's future executives are largely selected from the ranks of college graduates. Indeed many firms refuse to grant promotion to their men unless they have had a college education. Incidentally, it is becoming more and more difficult to rise from the ranks, as was customary in the past.

Personality is a great asset in selecting the executive, yet at the same time he should have a background of technical education along the lines he is going to pursue. The preponderance of managers having engineering degrees is marked in the engineering industries and is indicative that this technical background is necessary.

The executive-to-be should have had an education in economics and in cost accounting in addition to his otherwise strictly engineering education. He should have passed successfully his courses in mathematics and mechanics as evidence of his having an analytical mind. Many firms are now laying stress on the outside student activities of the prospect. If he has been taking a prominent part in the engineering magazine of the university—if he has been a leader in his fraternity—if he is an officer in his student technical society, he has demonstrated qualities of leadership.

The value of participation in athletics is a disputed point. A certain amount of athletics is good from the health standpoint, but many forms of sport, such as swimming, golf, tennis and so forth, are highly individualistic and do not encourage leadership. Football and basketball are better from the team-work sense and a degree of leadership may be observed in the conduct of these sports.

One prominent executive has stated the prospective executives should be men over 5 ft. 8 inches tall and should be well built, and of commanding presence. There is some truth in this view considered as a generality, but of course there are many exceptions. Unless an executive has demonstrated his ability in similar work, he should be selected, so to speak, as an apprentice with a period of training ahead of him to qualify him for the position.

Many a general manager prides himself, and rightly so, on his ability to select his lieutenants. On the other hand, many men have come to grief through their inability to select with wisdom the men who will work with them as associates.

Sir Stamp vs. Sir Jeans

By James B. Giern

Party of the first part is a banker and a railroad magnate—and a peer.

Party of the second part, also a peer, is a scientist—both of jolly old England.

At a recent gathering of notables in Great Britain, Stamp arose and delivered himself thus: "Inventors would be all right if they were not so chaotic—upsetting society with their new ideas." Whereupon Sir Jeans replied, "We can prove that inventors have given rise to a great many *more* industries than have been eliminated."

And now it is my turn—permit me to point to the fact that inventions (do not compare them with discoveries) are *never* spontaneous. Inventions, as a whole, are improvements and should be so named. Every new improvement is the forerunner of another—the inventor is merely the father. Then—in the name of reason—how can inventions be chaotic? In other words—inventions are unheard of before the desire or the demand. As a matter of fact unless the inventor is familiar with the origin he *cannot* invent anything. Perhaps that explains why Voltaire observed that, "could a dog make a picture of a god, the picture would resemble a dog."

Sir Jeans' stock phrase is by now a matter of high school debates—quite familiar and in addition so safe a claim, its truth is profound. What is not quite as well realized is the fact—that mighty few industries have been affected, let alone destroyed, by new inventions, but most have grown apace with increased demand.

More tallow candles are made now than ever before.

NEWS NOTES

Joe DeMontigney is the new dad of a bouncing young son.

John Nelson, Chief Tool Designer, Pioneer Engineering Co. is also a proud father of a nine and one half pound boy.

E. H. Johnson, formerly of Pontiac Motors, has been made Superintendent of Standards for Packard Motor Car Company.

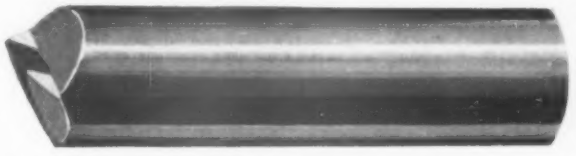
Tool designers—an extra large shift working days, in addition to a night shift—are speeding production of Packard's new medium-priced car.

"DIAMONDS IN THE ROUGH"

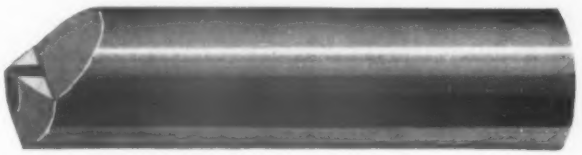
(Continued from page 6.)

angles, radii, and mountings, as well as the rigidity of the machine and spindles the tool is to be used on. Emphasis must be placed on the fact that all diamonds are brittle and will not stand shock and must be treated as the finest of precision tools to assure economy and high quality of production.

Therefore, industrial diamonds are the stimulus that benefits industry by making it possible to supply this supremely hard product of nature, now so essential in the manufacture of so many of our everyday necessities.



Above: An improperly designed diamond tool. The oversize stone, costing much more, has a tendency to produce a rough, unsatisfactory finished surface, while the scientifically designed diamond boring tool shown below, will give free cutting and provide the much desired mirror finish.



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#4 Cinn. Horizontal, Knee Control
#21 Lucas
#2 Cinn. S. P. D.

GRINDERS: #10 and #16 Blanchards, 16" and 30" Chucks
#2 Cinn. Centerless
#13 B & S, Union Hob

LATHES: 16 x 6 Hendey's M.D., 16 x 6 Sunstrand M.D., 16 x 16 Monarchs

SCREW MCHS.: #2 and 4 W & S—Acme

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The No. 1 Set contains two holders, thirteen cutters ranging from 5/16" to 1 1/8" diameter, three 7/8" diameter countersinks having 60°, 82°, and 90° included angle respectively, and a range of pilots from 5/32" to 7/8" diameter.

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The Cutters, Holders, and Pilots are conveniently arranged in solid oak receptacles. All tools are standard and can be replaced from stock without delay.

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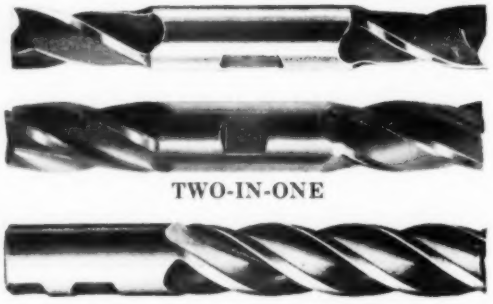

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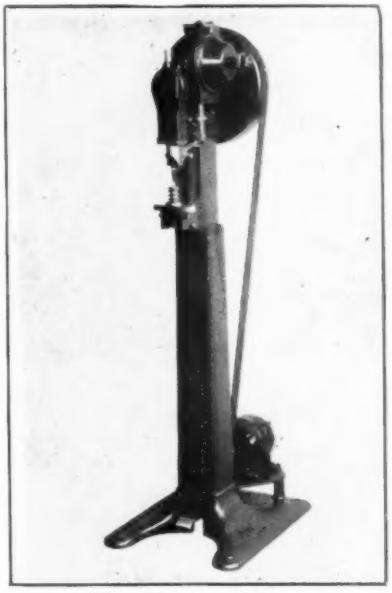

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Punches — then feeds and sets rivets.

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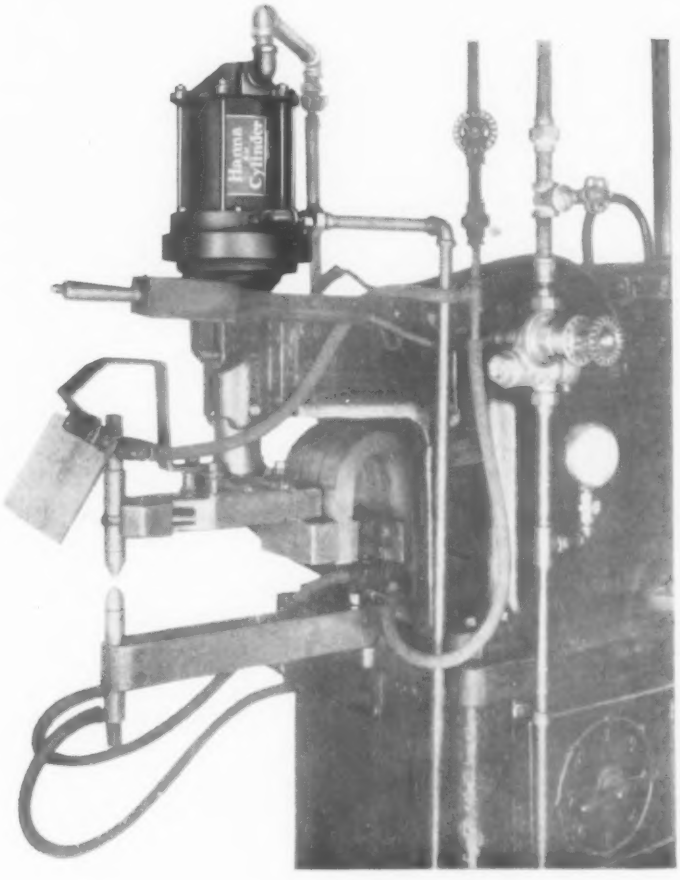

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Catalog 220 contains illustrations of other applications

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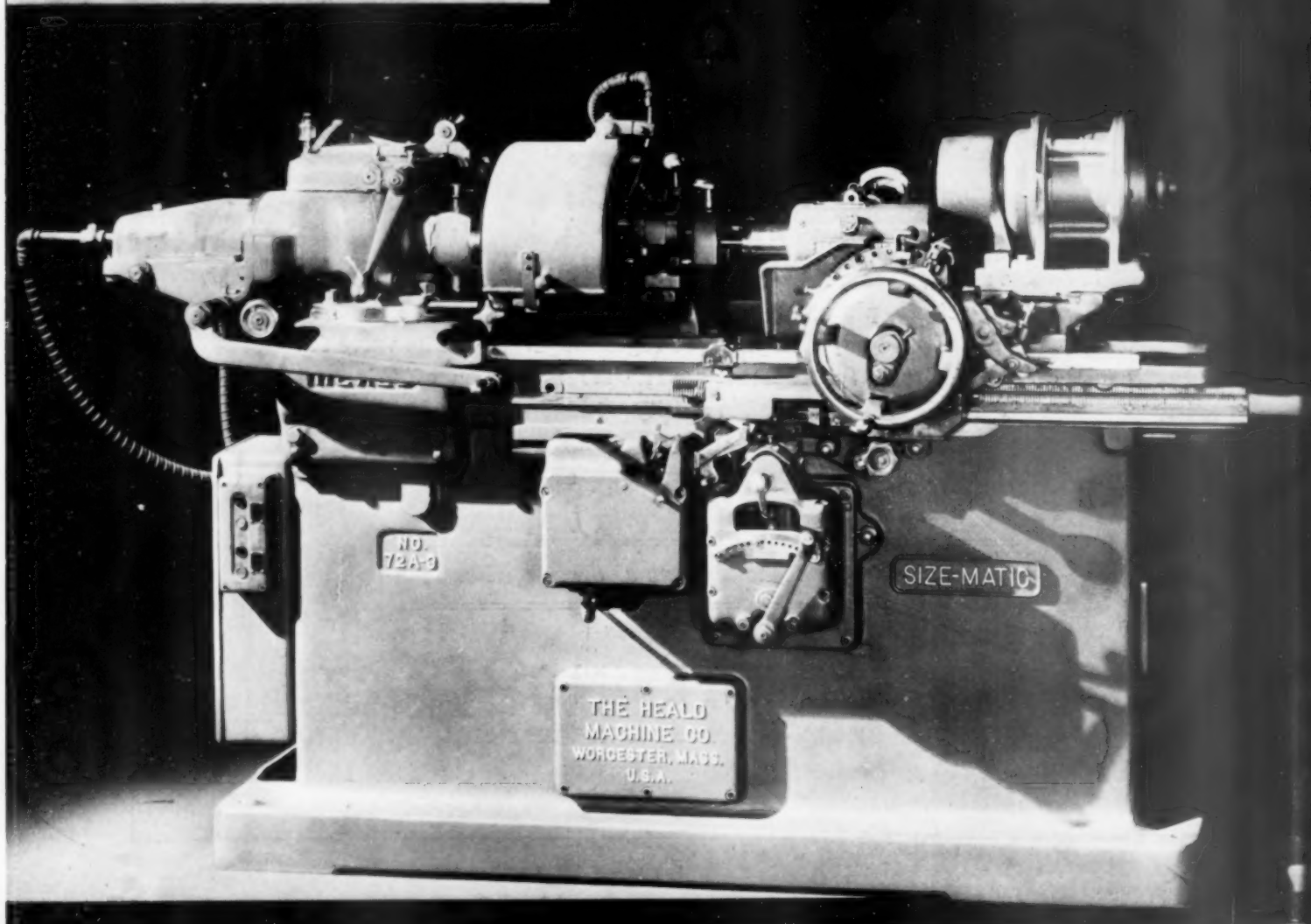
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